

Serial No.: 10/553,880

Examiner: David J. Goodwin

Title: FIELD EFFECT TRANSISTOR, ELECTRICAL ELEMENT ARRAY, AND MANUFACTURING METHOD FOR THE SAME

Page 6 of 9

REMARKS

Reconsideration is requested in view of the above amendments and the following remarks. Editorial revisions have been made in claims 7-9, 13-14, 16-18 and 20. The revisions are supported by the original disclosure, for example, page 4, lines 18-19, page 6, line 29 to page 7, line 5, page 8, lines 8-12, 19-26, and page 11, lines 24-27 of the present specification. No new matter has been introduced. Claims 1-6 and 15 have been canceled without prejudice. Claims 7-14 and 16-20 remain pending in the application.

Claim Objections

Claims 13, 14 and 15 are objected to because of informalities. Claims 13 and 14 have been editorially revised. Claim 15 has been canceled, rendering the objection moot. Applicants are not conceding the correctness of the objection.

Claim Rejections – 35 USC § 103

Claims 1-6 are rejected under 35 USC 103(a) as being unpatentable over Dodabalapur et al. (US 6,278,127) in view of Shim et al. (Moonsub Shim et al., "Polymer Functionalization for Air-Stable n-Type Carbon Nanotube Field-effect Transistors," J. Am. Chem. Soc. 123, pp. 11512-13 (2001)). Applicants respectfully traverse this rejection. Claims 1-6 have been canceled without prejudice, rendering the rejection moot. Applicants are not conceding the correctness of the rejection.

Claims 7-10 and 12 are rejected under 35 USC 103(a) as being unpatentable over Bai et al. (US 2004/0222412) in view of Shim et al., and further in view of Takenaka (US 6,882,016). Applicants respectfully traverse this rejection.

Claim 7 requires carbon nanotubes of an n-type semiconductor layer and carbon nanotubes of a p-type semiconductor layer that are formed in the same step and of the same materials. In one embodiment, the present carbon nanotubes are applied to the entire surface of a substrate, on which a plurality of source electrodes, drain electrodes and gate electrodes have been formed, to form a p-type semiconductor layer. Next, applying an n-type modifying polymer layer to the portion of the p-type semiconductor

Serial No.: 10/553,860

Examiner: David J. Goodwin

Title: FIELD EFFECT TRANSISTOR, ELECTRICAL ELEMENT ARRAY, AND MANUFACTURING METHOD FOR THE SAME

Page 7 of 9

layer that is intended to be converted to the n-type and obtaining n-type semiconductor layers. According to this example, the portion of the p-type semiconductor layer is converted into n-type concurrently with the formation of the n-type modifying polymer layer (see page 11, line 24 to page 13, line 10 of the present specification).

Takenaka is cited as suggesting both n-type and p-type semiconductor layers on the same substrate. However, the reference fails to disclose or suggest carbon nanotubes of an n-type semiconductor layer and carbon nanotubes of a p-type semiconductor layer formed in the same step and of the same materials, as required by claim 1. The semiconductor layers of the Takenaka p-channel thin film transistor and n-channel thin film transistor appear to be of different materials when they are formed on the substrate. Also Takenaka is silent as to the semiconductor layers of the p-channel thin film transistor and n-channel thin film transistor being formed in the same step.

Neither Bai et al. nor Shim et al. remedy the deficiencies of Takenaka. For at least these reasons above, claim 7 is patentable over Bai et al. in view of Shim et al., and further in view of Takenaka. Claims 8-10 and 12 ultimately depend from claim 7 and are patentable along with claim 7 and need not be separately distinguished at this time. Applicants are not conceding the relevance of the rejection to the remaining features of the rejected claims.

Claims 11, 13, 14 and 15 are rejected under 35 USC 103(a) as being unpatentable over Bai et al. in view of Shim et al., further in view of Takenaka, and further in view of Sato et al. (US 6,002,462). Applicants respectfully traverse this rejection. Claim 15 has been canceled without prejudice, rendering the rejection moot. Applicants are not conceding the correctness of the rejection. Claims 11, 13 and 14 ultimately depend from claim 7 and are patentable over Bai et al. in view of Shim et al., further in view of Takenaka, and further in view of Sato et al. for at least the same reasons discussed above regarding claims 7-10 and 12. Sato et al. do not remedy the deficiencies of Bai et al., Shim et al. and Takenaka. Applicants are not conceding the relevance of the rejection to the remaining features of the rejected claims.

Serial No.: 10/553,860

Examiner: David J. Goodwin

Title: FIELD EFFECT TRANSISTOR, ELECTRICAL ELEMENT ARRAY, AND MANUFACTURING METHOD FOR THE SAME

Page 8 of 9

Claims 16-20 are rejected under 35 USC 103(a) as being unpatentable over Dodabalapur et al. in view of Shim et al., and further in view of Bai et al. Applicants respectfully traverse this rejection.

Claim 16 is directed to a method for manufacturing a field effect transistor including forming a p-type semiconductor layer comprising carbon nanotube between the source electrode and the drain electrode. Dodabalapur et al. fail to disclose or suggest such a method for manufacturing a field effect transistor as required by claim 16. On the contrary, the Dodabalapur et al. Fig. 2 shows an organic semiconductor layer 21 that is not formed between a source electrode 12 and a drain electrode 13. Instead, the Dodabalapur et al. organic semiconductor layer 21 is formed on another semiconductor layer 16 (see Dodabalapur et al., col. 5, lines 6-13). In addition, Dodabalapur et al. disclose a p-type semiconductor layer being in direct contact with an n-type semiconductor layer to form a p-n junction (see Dodabalapur et al., col. 2, line 53 to col. 3, line 4), which is completely distinct from the field effect transistor as required by claim 16.

For at least these reasons, claim 16 is patentable over Dodabalapur et al. in view of Shim et al., and further in view of Bai et al. Claims 17-19 ultimately depend from claim 16 and are patentable along with claim 16 and need not be separately distinguished at this time. Applicants are not conceding the relevance of the rejection to the remaining features of the rejected claims.

Claim 20 is directed to a method for manufacturing an electrical element array having an n-type field effect transistor and a p-type field effect transistor including forming a p-type semiconductor layer comprising carbon nanotube between the source electrode and the drain electrode. Claim 20 is patentable over Dodabalapur et al. in view of Shim et al., and further in view of Bai et al. for reasons similar to those discussed above regarding claim 16. Applicants are not conceding the relevance of the rejection to the remaining features of claim 20.

Serial No.: 10/553,860

Examiner: David J. Goodwin

Title: FIELD EFFECT TRANSISTOR, ELECTRICAL ELEMENT ARRAY, AND MANUFACTURING METHOD FOR THE SAME

Page 9 of 9

In view of the above, favorable reconsideration in the form of a notice of allowance is respectfully requested. Any questions regarding this communication can be directed to the undersigned attorney, Douglas P. Mueller, Reg. No. 30,300, at (612) 455-3804.

Dated: January 10, 2007

DPM/cy

Respectfully submitted,

HAMRE, SCHUMANN, MUELLER &
LARSON, P.C.
P.O. Box 2902-0902
Minneapolis, MN 55402-0902
(612) 455-3800

By: 

Douglas P. Mueller
Reg. No. 30,300